Air Quality Impact Assessment
Proposed Hudson Casino
Attachment 6A

Introduction

A revised assessment of potential air quality impacts from traffic was performed using the most recent traffic data developed by BRW. The EPA-approved air dispersion model CAL3QHC was used to conduct the air quality impacts assessment for the I-94/Carmichael interchange intersections, as well as the intersections of Carmichael & Crestview/Stageline Drive and Carmichael & Center Drive. It was used to assess micro-scale carbon monoxide impacts near intersections. Given source strength, meteorology, site geometry, and site characteristics, the model can predict pollutant concentrations for receptors within 500 meters of the roadway. The scenarios evaluated included existing baseline traffic conditions and future conditions, as described below:

CASE	Description
A	2010 with Stageline development, with casino, existing traffic pattern
B	2010 with Stageline development, without casino, existing traffic pattern
C	2010 with Stageline development, with casino, upgraded traffic pattern
D	2010 with Stageline development, without casino, upgraded traffic pattern
E	2010 without Stageline development, without casino, existing traffic pattern
F	2010 without Stageline development, without casino, upgraded traffic pattern
G	Baseline traffic 2001, existing traffic pattern, w/o Stageline, w/o casino
H	Baseline traffic 2001, existing traffic pattern, w/ casino only
I	Baseline traffic 2001, existing traffic pattern, w/ Stageline development only
J	Baseline traffic 2001, existing traffic pattern, w/ casino and Stageline development
K	2010 without Stageline development, with casino, existing traffic pattern
L	2010 without Stageline development, with casino, upgraded traffic pattern

Notes:

Existing Traffic Pattern - Carmichael & Crestview intersection without physical geometry/lane changes

Upgraded Traffic Pattern - Carmichael & Crestview intersection with added turning lanes to southbound Carmichael left turn and westbound Stageline right turn, and total Signal time increased from 80 to 90 seconds

Baseline Traffic 2001 - traffic counts as measured in 1999 traffic study - represents existing traffic conditions (using 2001 emission rates)

Cases H, I, & J have incrementally added development from casino and/or Stageline development without other normal traffic growth (e.g., case G growth to case E)

Methodology

The EPA-approved emission model MOBILE5a was used to estimate emission rates for traffic idling at intersection signal lights, as well as for traffic moving at the posted speed limits on the roadways. Speed limits were set at 45 mph for north and southbound traffic on Carmichael, while 30 mph was used for east-west traffic at all other intersecting roadways in this study.

Traffic information related to number of lanes, stoplight signal timing, volumes, and turning movements were taken from the traffic data developed by BRW. Receptors were places near the edges of the roadways consistent with EPA's *Guidance for Modeling Carbon monoxide from Roadway Intersections* (USEPA, 1992). Up to 20 receptors were placed at the edges of roadways for each intersection. The predicted concentration from

maximum impacted receptor from all intersections was compared to the applicable ambient air quality standard (AAQS), after adding the ambient background concentrations. Ambient standards have been created for carbon monoxide for both 1-hour and 8-hour averaging periods. The WDNR has established ambient background levels for 1- and 8-hour averaging periods, at 3.3 ppm and 1.8 ppm, respectively for rural areas of the state.

Traffic volumes for 8-hour traffic were estimated using data prepared by BRW. The average hourly volumes for 8-hour traffic were estimated for all intersections/turning movements using the ratio of the highest average hourly (8-hour average) volume to the peak hour volume of traffic from the field measurements for traffic counts used by BRW in the updated traffic study. This ratio indicates that the 8-hour average hourly volumes are approximately 84% of the peak hour traffic volume. As a result, the peak hour traffic volume data were factored down to create 8-hour traffic data. This ratio was applied uniformly to all intersections/turning movements.

The peak hourly traffic volumes were used to estimate 1-hour CO predicted concentrations. The results were compared for all receptors, for all intersections, and for all scenarios (A-L). The highest predicted concentration for 1-hour impacts was 18.4 ppm. Ambient background of 3.3 ppm was added to determine the total predicted impact of 22 ppm. This concentration is below the 1-hour AAQS of 35 ppm.

The average hourly (8-hour average) traffic volumes were used to predict 8-hour concentrations. The dispersion model predicted a 1-hour concentration. To obtain an 8-hour concentration, a persistence factor of 0.6 is applied to the 1-hour value. The resulting 8-hour concentration is then added to the background ambient concentration (8-hour average) to obtain the total predicted 8-hour concentration for comparison to the 8-hour AAQS.

Results
Summary results from the dispersion modeling are presented in Tables 6A-1 to 6A-5. This analysis demonstrates that:

- The one-hour carbon monoxide ambient air quality standard is not exceeded presently and will not be exceeded with the proposed development either in the baseline case or in the 2010 case,

- The 2010 predicted traffic in the project area with the addition of the proposed casino project is not estimated to cause an exceedance of the one-hour or eight-hour carbon monoxide ambient air quality standard, however,

- The 2010 predicted traffic in the project area with the addition of the Stageline Road Development (with or without the proposed casino project) is estimated to potentially cause an exceedance of the eight-hour carbon monoxide ambient air quality standard.

Discussion of Calculation of CO impacts

As with all Gaussian models, a number of supporting assumptions limit CAL3QHC's ability to fully describe the physical conditions of the source and the atmosphere. These assumptions are necessary to solve the complex dispersion processes that occur in the atmosphere. Many of the processes that disperse pollutants are not well understood, or are too complex to solve without the aid of some major assumptions. The assumptions used in deriving and applying Gaussian models are the reasons that the model results tend to be conservative. That is, modeled estimates of downwind concentrations can be larger for a location as compared to an actual measurement at the same location. In addition, this application of CAL3QHC used several worst-case assumptions in order to ensure the model's estimate will be conservative. These include employing a worst-case wind angle search, using the maximum projected hour traffic volume, and assuming that peak traffic conditions will be coincident with worst case meteorological conditions.

Reference –

US EPA 1992. Guideline for Modeling Carbon Monoxide from Roadway Intersections. (EPA-454/R-92-005) Office of Air Quality Planning and Standards. November 1992.

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Table 6A-1

Maximum Predicted Carbon Monoxide (CO) Concentrations parts per million (ppm)
Intersections: All

	Peak traffic MAX				Avg. hr. traffic (8-hr) MAX					
Case	1-hour CO impacts (ppm)	1-hr CO bkgd (ppm)	1-hr CO TOTAL (ppm)	1-hr CO STD (ppm)	1-hour CO impacts (ppm)	8-hr persistence factor	8-hour CO impacts (ppm)	8-hr CO bkgd (ppm)	8-hr CO TOTAL (ppm)	8-hr CO STD (ppm)
A	18.4	3.3	21.7	35	17.0	0.6	10.2	1.8	**12.0**	9
B	16.8	3.3	20.1	35	15.7	0.6	9.4	1.8	**11.2**	9
C	17.4	3.3	20.7	35	15.9	0.6	9.5	1.8	**11.3**	9
D	16.1	3.3	19.4	35	14.9	0.6	8.9	1.8	**10.7**	9
E	12.3	3.3	15.6	35	11.5	0.6	6.9	1.8	8.7	9
F	12.6	3.3	15.9	35	11.8	0.6	7.1	1.8	8.9	9
G	11.5	3.3	14.8	35	10.6	0.6	6.4	1.8	8.2	9
H	11.7	3.3	15.0	35	10.9	0.6	6.5	1.8	8.3	9
I	15.8	3.3	19.1	35	14.6	0.6	8.8	1.8	**10.6**	9
J	17.4	3.3	20.7	35	16.1	0.6	9.7	1.8	**11.5**	9
K	12.5	3.3	15.8	35	12.3	0.6	7.4	1.8	9.2	9
L	12.9	3.3	16.2	35	12.2	0.6	7.3	1.8	9.1	9

Notes:

1. Bkgd = Ambient background concentrations for the Hudson area.

2. STD - carbon monoxide ambient air quality standard. The standard is expressed as a whole number, thus results should be compared as a whole number. However the modeled results are provided to one decimal place to show the incremental changes.
3. **Bold** value indicates an exceedance of the standard.

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Table 6A-2

Maximum Predicted CO Concentrations (ppm)
Intersection: Carmichael & I-94 Westbound Ramps

	Peak traffic MAX				Avg. hr. traffic (8-hr) MAX					
Case	1-hour CO impacts (ppm)	1-hr CO bkgd (ppm)	1-hr CO TOTAL (ppm)	1-hr CO STD (ppm)	1-hour CO impacts (ppm)	8-hr persistence factor	8-hour CO impacts (ppm)	8-hr CO bkgd (ppm)	8-hr CO TOTAL (ppm)	8-hr CO STD (ppm)
A	13.2	3.3	16.5	35	12.5	0.6	7.5	1.8	9.3	9
B	13.0	3.3	16.3	35	12.0	0.6	7.2	1.8	9.0	9
C	13.2	3.3	16.5	35	12.7	0.6	7.6	1.8	9.4	9
D	13.1	3.3	16.4	35	12.4	0.6	7.4	1.8	9.2	9
E	11.6	3.3	14.9	35	11.1	0.6	6.7	1.8	8.5	9
F	11.5	3.3	14.8	35	10.4	0.6	6.2	1.8	8.0	9
G	11.1	3.3	14.4	35	10.6	0.6	6.4	1.8	8.2	9
H	11.4	3.3	14.7	35	10.9	0.6	6.5	1.8	8.3	9
I	12.2	3.3	15.5	35	11.1	0.6	6.7	1.8	8.5	9
J	11.6	3.3	14.9	35	12.6	0.6	7.6	1.8	9.4	9
K	11.3	3.3	14.6	35	12.3	0.6	7.4	1.8	9.2	9
L	11.8	3.3	15.1	35	12.2	0.6	7.3	1.8	9.1	9

Notes:

1. Bkgd = Ambient background concentrations for the Hudson area.

2. STD - carbon monoxide ambient air quality standard. The standard is expressed as a whole number, thus results should be compared as a whole number. However the modeled results are provided to one decimal place to show the incremental changes.

3. **Bold** value indicates an exceedance of the standard.

Table 6A-3

Maximum Predicted CO Concentrations (ppm)
Intersection: Carmichael & I-94 Eastbound Ramps

Case	Peak traffic MAX 1-hour CO impacts (ppm)	1-hr CO bkgd (ppm)	1-hr CO TOTAL (ppm)	1-hr CO STD (ppm)	Avg. hr. traffic (8-hr) MAX 1-hour CO Impacts (ppm)	8-hr persistence factor	8-hour CO impacts (ppm)	8-hr CO bkgd (ppm)	8-hr CO TOTAL (ppm)	8-hr CO STD (ppm)
A	12.6	3.3	15.9	35	11.5	0.6	6.9	1.8	8.7	9
B	12.0	3.3	15.3	35	11.1	0.6	6.7	1.8	8.5	9
C	12.7	3.3	16.0	35	11.6	0.6	7.0	1.8	8.8	9
D	12.2	3.3	15.5	35	11.0	0.6	6.6	1.8	8.4	9
E	11.2	3.3	14.5	35	10.4	0.6	6.2	1.8	8.0	9
F	10.9	3.3	14.2	35	10.4	0.6	6.2	1.8	8.0	9
G	10.2	3.3	13.5	35	9.5	0.6	5.7	1.8	7.5	9
H	10.7	3.3	14.0	35	10.0	0.6	6.0	1.8	7.8	9
I	11.0	3.3	14.3	35	10.4	0.6	6.2	1.8	8.0	9
J	11.6	3.3	14.9	35	10.9	0.6	6.5	1.8	8.3	9
K	11.7	3.3	15.0	35	10.8	0.6	6.5	1.8	8.3	9
L	11.6	3.3	14.9	35	10.8	0.6	6.5	1.8	8.3	9

Notes:

1. Bkgd = Ambient background concentrations for the Hudson area.

2. STD - carbon monoxide ambient air quality standard. The standard is expressed as a whole number, thus results should be compared as a whole number. However the modeled results are provided to one decimal place to show the incremental changes.

3. **Bold** value indicates an exceedance of the standard.

Table 6A-4

Maximum Predicted CO Concentrations (ppm)
Intersection: Carmichael & Crestview/Stageline Rd.

| Case | Peak traffic MAX | | | | Avg. hr. traffic (8-hr) MAX | | | | | |
	1-hour CO impacts (ppm)	1-hr CO bkgd (ppm)	1-hr CO TOTAL (ppm)	1-hr CO STD (ppm)	1-hour CO impacts (ppm)	8-hr persistence factor	8-hour CO impacts (ppm)	8-hr CO bkgd (ppm)	8-hr CO TOTAL (ppm)	8-hr CO STD (ppm)
A	18.4	3.3	21.7	35	17.0	0.6	10.2	1.8	**12.0**	9
B	16.8	3.3	20.1	35	15.7	0.6	9.4	1.8	**11.2**	9
C	17.4	3.3	20.7	35	15.9	0.6	9.5	1.8	**11.3**	9
D	16.1	3.3	19.4	35	14.9	0.6	8.9	1.8	**10.7**	9
E	12.3	3.3	15.6	35	11.5	0.6	6.9	1.8	8.7	9
F	12.6	3.3	15.9	35	11.8	0.6	7.1	1.8	8.9	9
G	11.5	3.3	14.8	35	10.5	0.6	6.3	1.8	8.1	9
H	11.7	3.3	15.0	35	10.8	0.6	6.5	1.8	8.3	9
I	15.8	3.3	19.1	35	14.6	0.6	8.8	1.8	**10.6**	9
J	17.4	3.3	20.7	35	16.1	0.6	9.7	1.8	**11.5**	9
K	12.5	3.3	15.8	35	11.6	0.6	7.0	1.8	8.8	9
L	12.9	3.3	16.2	35	11.9	0.6	7.1	1.8	8.9	9

Notes:

1. Bkgd = Ambient background concentrations for the Hudson area.

2. STD - carbon monoxide ambient air quality standard. The standard is expressed as a whole number, thus results should be compared as a whole number. However the modeled results are provided to one decimal place to show the incremental changes.

3. **Bold** value indicates an exceedance of the standard.

Table 6A-5

Maximum Predicted CO Concentrations (ppm)
Intersection: Carmichael & Center Rd.

Case	Peak traffic MAX 1-hour CO impacts (ppm)	1-hr CO bkgd (ppm)	1-hr CO TOTAL (ppm)	1-hr CO STD (ppm)	Avg. hr. traffic (8-hr) MAX 1-hour CO Impacts (ppm)	8-hr persistence factor	8-hour CO impacts (ppm)	8-hr CO bkgd (ppm)	8-hr CO TOTAL (ppm)	8-hr CO STD (ppm)
A	9.0	3.3	12.3	35	8.3	0.6	5.0	1.8	6.8	9
B	8.4	3.3	11.7	35	7.9	0.6	4.7	1.8	6.5	9
C	9.2	3.3	12.5	35	8.7	0.6	5.2	1.8	7.0	9
D	8.6	3.3	11.9	35	8.3	0.6	5.0	1.8	6.8	9
E	7.7	3.3	11.0	35	6.9	0.6	4.1	1.8	5.9	9
F	8.1	3.3	11.4	35	7.4	0.6	4.4	1.8	6.2	9
G	6.9	3.3	10.2	35	6.3	0.6	3.8	1.8	5.6	9
H	7.6	3.3	10.9	35	6.9	0.6	4.1	1.8	5.9	9
I	8.0	3.3	11.3	35	7.4	0.6	4.4	1.8	6.2	9
J	8.6	3.3	11.9	35	7.8	0.6	4.7	1.8	6.5	9
K	8.2	3.3	11.5	35	7.6	0.6	4.6	1.8	6.4	9
L	8.7	3.3	12.0	35	7.9	0.6	4.7	1.8	6.5	9

Notes:

1. Bkgd = Ambient background concentrations for the Hudson area.

2. STD - carbon monoxide ambient air quality standard. The standard is expressed as a whole number, thus results should be compared as a whole number. However the modeled results are provided to one decimal place to show the incremental changes.
3. **Bold** value indicates an exceedance of the standard.